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ABSTRACT

Described is a mathematical model developed to analyze and project nursing requirements and resources in New York State one to five years into the future. The model was developed as part of a manpower planning project at the Western Interstate Commission for Higher Education. New York was one of six states that tested the model. Because it incorporates all major elements of manpower supply and demand the model should be of particular interest to health systems agencies, units of state government responsible for health care, and providers of health care. Its requirements for professional judgment create many opportunities for much needed communication on a variety of important topics. Although designed specifically to study nursing manpower, it appears to have significant potential for the study of manpower in other health professions. (Author/MSE)

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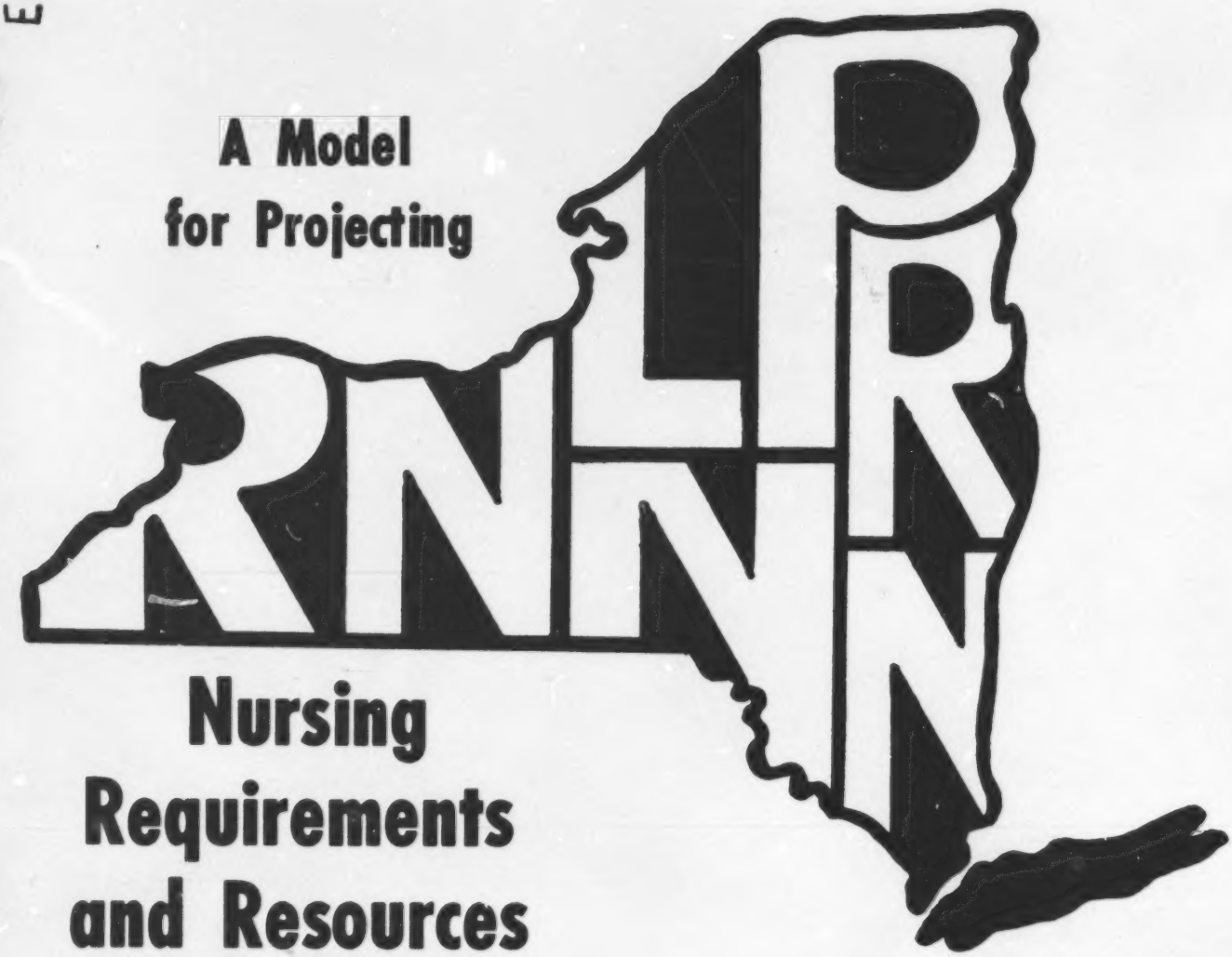
A Model for Projecting Nursing Requirements and Resources in New York State



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The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12234

A MODEL FOR PROJECTING NURSING REQUIREMENTS AND RESOURCES IN NEW YORK STATE

April 1978

The University of the State of New York
The State Education Department
Office of the Executive Secretary to the State Board for Nursing
and
Office of Postsecondary Research, Information Systems and Institutional Aid
Albany, N. Y. 12230

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FOREWORD

This report describes a mathematical model developed to analyze and project nursing requirements and resources in New York State one to five years into the future. The model was developed as part of a manpower planning project at the Western Interstate Commission for Higher Education (WICHE), funded by Department of Health, Education and Welfare, Division of Nursing Health Resources Administration. New York was one of six states that tested the model.

The basic model was developed by the WICHE project staff assisted by the nursing community through a task force, national conferences, and field development activities. It was adapted for use in New York State by the Office of the Executive Secretary to the State Board for Nursing and the Office for Postsecondary Research, Information Systems and Institutional Aid of the New York State Education Department.

Because it incorporates all major elements of manpower supply and demand, the model should be of particular interest to Health Systems Agencies (HSA's), units of State government responsible for health care, and providers of health care. Its requirements for professional judgment create many opportunities for much needed communication on a variety of important topics. Although the model has been designed specifically to study nursing manpower, it appears to have significant potential for the study of manpower in other health professions as well.

Readers desiring additional information about the model or the pilot testing should contact either Mildred S. Schmidt, Executive Secretary, State Board for Nursing (518) 474-3843 or Paul Wing, Coordinator, Office of Post-secondary Research, Information Systems and Institutional Aid (518) 474-5091.

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Implementation of the nursing manpower planning model would not have been possible without the help of an advisory committee of individuals knowledgeable about a wide variety of aspects of both nursing education programs and practice settings. A list of their names and affiliations is provided below. Their willingness to discuss and agree on assumptions about health care needs and services and the numbers and educational preparation of nurses required to meet the needs five years from now made it possible to "run" the model. The participation of staff from various State agencies in the discussions of the advisory committee also contributed to the development of realistic assumptions and relationships. Advice and current data were provided by a number of State agencies, especially the Department of Health, the Department of Mental Hygiene, the Health Planning Commission, and the Division of the Budget.

This report was prepared by Norma L. Woodruff, Associate in Nursing Education and Donald Nutter, Associate in Education Research.

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INTRODUCTION

Nursing Requirements and Resources

The need for reliable information and projections about health manpower has never been greater. This need has been emphasized with the passage of recent legislation. The Nurse Training Act of 1975 (PL 94-63) requires annual reports to Congress on the supply and requirements for nurses nationally and for each state. The Health Planning and Resource Development Act of 1975 (PL 93-641) provides for Health Systems Agencies (HSA's) and assigns to them responsibility for health manpower planning. More generally the prospect of national health insurance, concern with access to health care and containment of its costs, expansion of nursing roles, changing population needs, and other factors dictate the need for projecting future supply, distribution, and requirements for nursing personnel in an effective, credible manner.

Descriptive studies of the supply and distribution of registered nurses and licensed practical nurses have been conducted at both state and national levels in recent years [1,* 2, 3, 4]. Specific segments of the nurse population, such as faculty in schools of nursing, have been examined as well as the source of supply, the nursing education system itself [5,6]. These studies suggest important topics for further study such as geographic distribution of nurses, current and emerging roles of nurses and specialty preparation. To project future requirements, however, newer techniques, both quantitative and qualitative, are required. Some effective models have developed [7,8,9]; however, there is still a need for models which combine detail, economy, and ease of implementation. The model developed by the Western Interstate Commission on Higher Education (WICHE) represents one such model [10]. While not simple in

*See references on page 31.

design, it is relatively easy to use and to install on a computer. It produces projections which not only take into account a variety of quantitative factors and relationships but also provides for user judgments in those aspects of the problem which often cannot be expressed adequately in quantitative form. In addition, it provides opportunities for interaction among educators, practitioners and planners, thus serving as a vehicle for communication and education as well as a manpower planning tool.

A MODEL FOR PROJECTING REQUIREMENTS FOR NURSES IN NEW YORK STATE

A model is an abstract representation of some real object or situation. It can use either qualitative or quantitative descriptors and relationships. In describing their nursing manpower model, the WICHE staff put it this way: a model is... "a mathematical and necessarily approximate representation of reality. It must be formulated to capture the crux of the decision-making problem. At the same time, it must be sufficiently free of burdensome minor detail to lend itself to finding an improved solution that is capable of implementation."

The WICHE nursing manpower model provides an analytic process and framework for estimating future nursing requirements and resources. The basic relationships of the model are shown in Figure 1. The model simulates present health care needs based on actual demographic statistics, existing health programs and services to meet these needs, and the present nursing manpower situation. These basic relationships are then used as the basis for projecting future needs.

In the model the nursing personnel data are segregated by type of license, by service or employment setting, by educational attainment, and by employment position (see Figure 2). The resulting projections take account of the diversity of people and skills within the total pool of nursing manpower as well as the settings in which they practice.

Using the Model

The first step in using the model is to compile all the required data into a comprehensive historical data base. These data serve as the foundation for all the calculations that are performed. Then assumptions are made about changes which can be anticipated in the population, the available health services and the nursing personnel needed.

Figure 1. Major Relationships of the Nursing Manpower Model

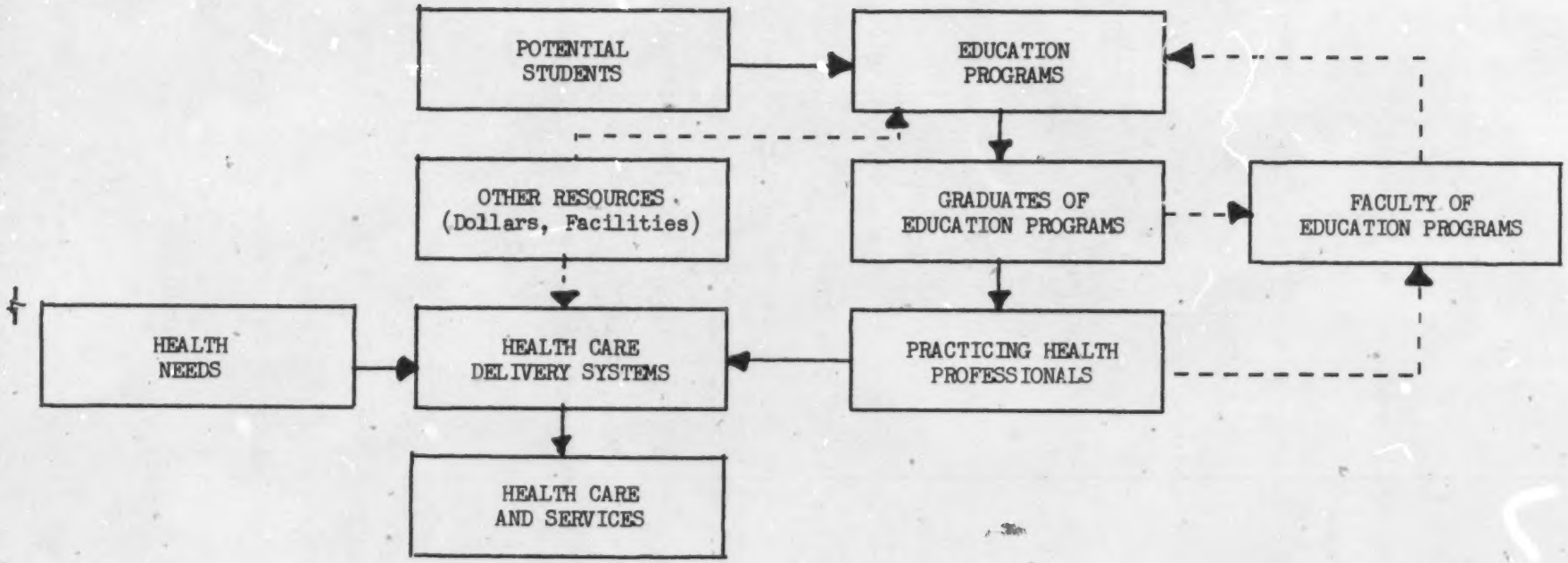
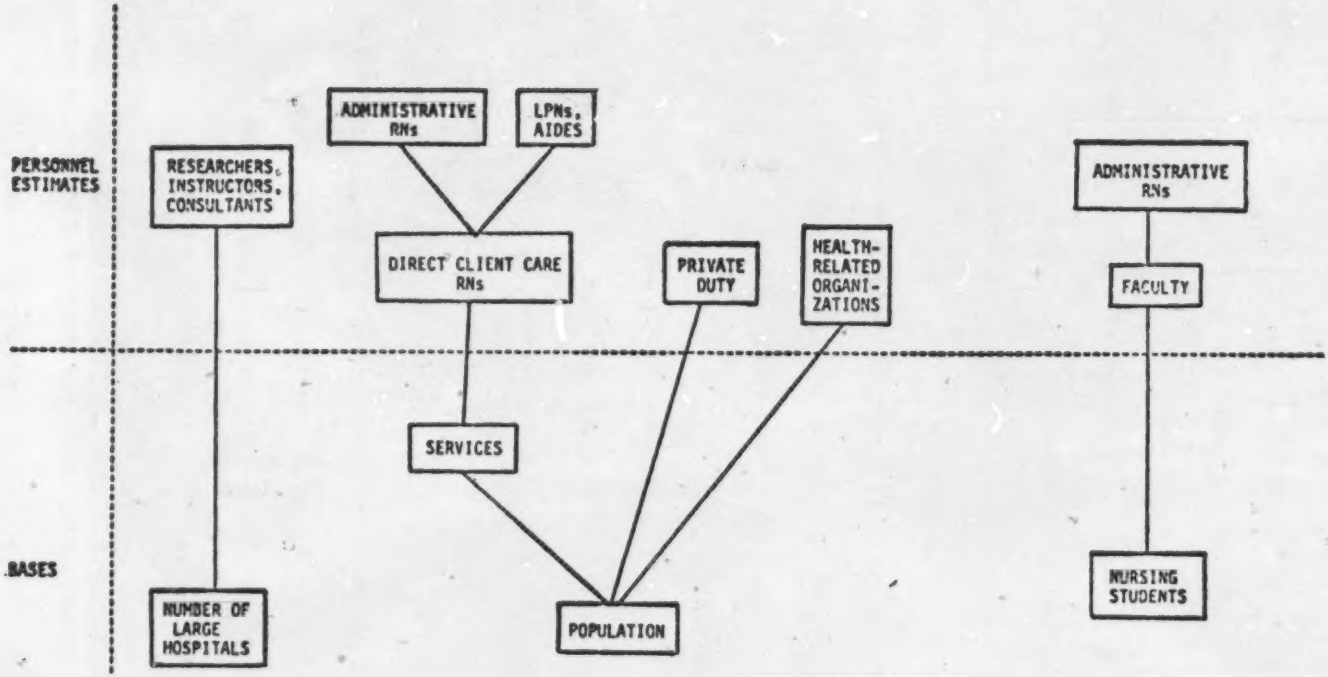


Figure 2. Bases for Projecting the FTE Number of Nurses Needed



SOURCE: Nursing Resources and Requirements: A Guide for State Level Planning, WICHE, 1976.

Examples of the assumption worksheets used in actual runs of the model are provided in Appendix A. These assumed changes are generally formulated to raise "what if" questions, singly or in combination. For example, one could ask what would be the effect on the number and kinds of nursing personnel needed if there were:

1) a marked decline in population in the State and fewer hospital beds;

2) an increase in the number of home care visits per year;

3) a decrease in the number of coronary care patients requiring intensive care;

4) an increased utilization of emergency room services.

Similarly, "what if" questions pertaining to the educational preparation of nurses could be asked. For example, what would be the projected effect of:

1) changing the educational requirement for nurses in administrative positions in hospitals?

2) requiring school nurses to have advanced degrees?

The specific assumptions about nursing personnel requirements used in the model involved establishing staffing needs in terms of full-time equivalent (FTE) nurses by service, by setting, and by educational preparation levels believed to be necessary to provide the needed services. (Appendix A provides examples for 1976 and 1981.) To account for nursing personnel in various roles with differing technical and professional skills, registered nurses (RN's) were identified as: direct client care RN's (DCC RN's); nursing service administrators; researchers, instructors and consultants; faculty and administrators in schools of nursing; private duty nurses; and nurses employed in health-related organizations. The desired mix according to educational level for each of these role categories was then determined. Based on the specific assumptions made, it was possible to project the required number of RN's by educational preparation for each of the various role categories by service setting. Projections of the number of LPN's and aides needed by 1981 were also developed using the same methodology. The

resulting calculations for 1976 are portrayed in Table 1 and the projections for 1981 in Table 2. These figures are estimates which must be viewed within the context and limitations of the methodology.

To be useful in a policy making context projections of future needs for nursing personnel must be matched with comparable projections of the supply of nurses. Inbalances between projected supply and demand can then assist those concerned with health care and nursing education to make appropriate planning decisions.

The major factors influencing the supply of nurses are the educational system, the licensing process, the labor force participation rates, mobility and migration patterns, and other factors such as location of health care facilities. Although data are routinely collected at the national level on licensed nurses and from schools of nursing, data are lacking at the State level for other important factors that help to determine employment expectations. To provide some guidance for projecting the number of nurses available for employment in the future, a resources flow procedure has been developed (see Appendix B for a description). This procedure uses national and/or State data for projecting the number of graduates from the various types of educational programs, and historical attrition rates to account for other factors affecting supply.

Major Components of Software

In order to take full advantage of this model, it has been necessary to develop computer software to perform the required calculations. Use of the computer not only speeds up the processing time but also eliminates routine arithmetic errors. The major components of the software supporting the model are: the User Data Base, the Profile Report Generating System (PRGS), and the Requirements Calculation System (RCS). Both the PRGS and the RCS use series of control cards to selectively access the data base and to use the options in the model required to answer the questions. The basic components are shown in Figure 3.

Table 1. Analysis and Planning for Improved Distribution of Nursing Personnel and Services

Requirements Calculation Software
Summary Report

Year - 1976
Region - New York
Initial Projection

	Doctorate	Masters	RNS Baccalaureate	Associate	Diploma	Total
Service Settings						
Direct Client Care	98	1,158	10,846	8,079	55,646	75,827
Administrators	22	653	1,846	1,110	12,323	15,954
Researchers, Instructors, and Consultants	14	689	1,240	172	1,309	3,424
Schools of Nursing						
Faculty	136	1,682	945	75	284	3,122
Administrators	42	126	25	3	7	203
Health-Related Organizations						
All Positions	44	491	285	69	938	1,827
Private Duty						
All Positions	15	118	383	235	4,358	5,109
TOTAL	371	4,917	15,570	9,743	74,865	105,466
		LPNS	41,855			
		AIDES	35,520			

SOURCE: Output of Model

Table 2. Analysis and Planning for Improved Distribution of Nursing Personnel and Services

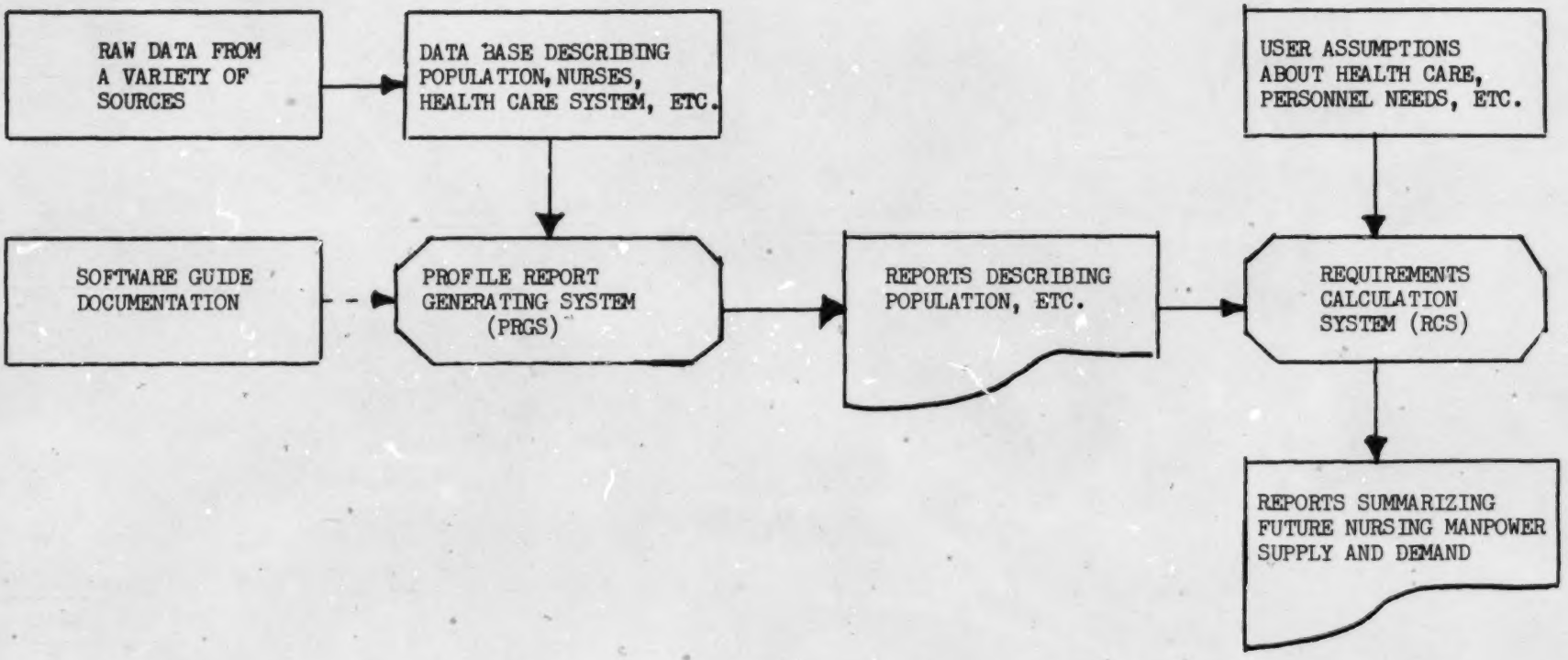
Requirements Calculation Software
Summary Report

Year - 1981
Region - New York
Initial 1981 Calculation

	RNS				
	Doctorate	Masters	Baccalaureate	Associate	Diploma	Total
Service Settings						
Director Client Care	92	2,232	20,082	7,748	52,502	82,656
Administrators	61	1,553	4,549	26	6,029	12,218
Researchs, Instructors, and Consultants	48	1,213	1,937	96	1,501	4,795
Schools of Nursing						
Faculty	779	2,726	643	0	193	4,341
Administrators	211	88	16	0	1	316
Health-Related Organizations						
All Positions	74	552	276	74	865	1,841
Private Duty						
All Positions	12	93	304	186	3,454	4,049
TOTAL	1,277	8,457	27,807	8,130	64,545	110,216
		LPNS	35,127			
		AIDES	54,267			

SOURCE: Output of Model

Figure 3. Major Components of the Computer Software Supporting the Nursing Manpower Model


RAW DATA FROM A VARIETY OF SOURCES
DATA BASE DESCRIBING POPULATION, NURSES, HEALTH CARE SYSTEM, ETC.
USER ASSUMPTIONS ABOUT HEALTH CARE, PERSONNEL NEEDS, ETC.
SOFTWARE GUIDE DOCUMENTATION
PROFILE REPORT GENERATING SYSTEM (PRGS)
REPORTS DESCRIBING POPULATION, ETC.
REQUIREMENTS CALCULATION SYSTEM (RCS)
REPORTS SUMMARIZING FUTURE NURSING MANPOWER SUPPLY AND DEMAND

SOURCE: WICHE [10]

The user data base developed for the project relied heavily on demographic and health care data by county compiled by WICHE from 20 different national sources. Through the PRGS a series of 54 profile reports summarizing these data at the State, county, or regional level may be produced, describing in tabular from the elements suggested in Figure 1. In testing the model in New York State, the base data were updated to 1976 wherever possible.

The RCS uses historical data from the profile reports to produce a set of projection reports for each run. These projections are calculated according to relationships built into the model by the user. In New York State the judgements of the advisory committee were used as a basis for some of the relationships.

Illustrative Applications of Model

Perhaps the best way to understand the model and its capabilities is to examine some illustrative applications. Two different questions are addressed below, one related to the impact of fewer numbers of general medical surgical beds in the State and the other related to home care visits.

1. What is the anticipated impact on the number of direct client care RN's (DCC RN's) of future changes in the number of general medical-surgical beds in hospitals in the next five years? What should be the mix of direct client care RN's in terms of educational preparation? To answer these questions, assumptions about the number of general medical-surgical beds and staffing patterns were required. First, the assumption was made that there would be a decrease of five to ten percent in the number of general medical-surgical beds in the State over the next five years. Among the reasons for this anticipated decrease were: Current emphasis on cost containment and bed decertification; utilization review and decreased length of patient stay; increasing numbers of surgical and diagnostic procedures performed on an outpatient basis; and changes in pediatric care with fewer

children hospitalized. With respect to staffing requirements, it was assumed that the ratio of DCC RN's/ten beds would not change. A further assumption was made that the number of RN's prepared at the baccalaureate level would increase to twenty-five percent of the total number employed and that a decrease in the number of nurses prepared at the associate degree and diploma levels would occur.

Translating these assumptions in to appropriate parameters in the model, it was then possible to use the model to estimate the total number of RN's at various educational levels required for employment in direct client care for patients in general medical-surgical beds five years in the future. The results obtained from the model for 1976 and for 1981 are shown in Tables 3 and 4, respectively.

Table 3. Number of Direct Client Care RN's (DCC RN's) for General Medical-Surgical Beds in 1976 and 1981

Year	Total Pouplation	Service/Population Ratio	DCC RN's/ Service Ratio	No. DCC RN's
1976	18,245,520	73.23/10,000 pop.	3.70/10 beds	49,436
1971	18,465,723	68.62/10,000 pop.	3.70/10 beds	46,731

Table 4. Number and Percent of DCC RN's for General Medical-Surgical Beds by Educational Preparation

		Doctorate	Masters	Baccalaureate	Associate	Diploma	Total
1976	No.	49	494	5735	5883	37,324	49,485
	%	0.1	1.0	11.6	11.9	75.5	
1981	No.	47	935	11,683	4673	29,441	46,779
	%	0.1	2.0	25.0	10.0	63.0	

As one can see from the tables, it is estimated that the number of DCC RN's will be less in 1981 than in 1976 with the given assumptions. However, a significant change in the "mix" of nurses by educational preparation is projected, with an increase in the number of nurses with baccalaureate or graduate preparation and a decrease in the number with lesser preparation.

2. How many FTE direct client care RN's will be needed for home care visits five years in the future? What should be the mix of direct client care RN's in terms of educational preparation who will be serving clients in their homes?

Home care visits were assumed to increase five to ten percent between 1976 and 1981. This was based on the advisory committee's awareness of the trend toward deinstitutionalization, efforts to contain cost through early discharge from the acute care setting, and the move toward more adequate home care benefits through insurance mechanisms. It was assumed that there would be an increase in the number of baccalaureate prepared nurses working in outreach home care services because of preparation for and interest on the part of baccalaureate prepared nurses. The expectations of home care agencies in their employment practices also would result in increased numbers of baccalaureate prepared nurses.

Tables 5 and 6 below portray the responses to the questions, including actual figures for 1976 and projections for 1981 as provided by the model.

Table 5. Number of Direct Client Care RN's (DCC RN's) for Home Care Services 1976 and 1981

Year	Total Population	Service/Population Ratio	DCC RN's/ Service Ratio	No. DCC RN's
1976	18,245,520	887.55/10,000 pop.	11.51/10,000 visits	1864
1981	18,405,723	976.31/10,000 pop.	11.52/10,000 visits	2070

Table 6. Number and Percent of DCC RN's for Home Care Service by Educational Preparation

Year		Doctorate	Masters	Baccalaureate	Associate	Diploma	Total
1976	No.	2	19	719	140	986	1866
	%	0.1	1.0	39.6	7.5	52.9	
1981	No.	0	62	1035	207	766	2070
	%		3.0	50.0	10	37	

The number of DCC RN's for home care visits in 1981 is estimated to increase as a result of both the increase in population and the increase in utilization of home care visits. The estimates also indicate there will be an increase in the number of nurses for direct client care who possess baccalaureate or higher degrees.

Advantages and Disadvantages of the Model

Based on experience obtained in pilot testing this model, a number of advantages and disadvantages have been identified. The advantages of the model may be summarized as follows:

1. The model explicitly provides for coordination of the health care and professional education aspects of the manpower supply and demand system.

2. It provides an objective, integrated data base for use in policy formulation and decision making. It helps to identify inadequacies in present data collection efforts.

3. It enables health policy makers to observe patterns, trends and relationships that otherwise would appear to be a mass of seemingly unrelated data.

4. It requires that assumptions about future changes in health care delivery and staffing patterns be defined and quantified.

5. It encourages, possibly requires, input from experts in the field based upon their experience, knowledge and informed judgement. This facilitates communication and exchange of information with various agencies and concerned groups because of the necessary preliminary steps to secure or verify essential data.

6. It is not excessively complex, thus permitting health care professionals with little quantitative experience or background to learn to use the model readily.

The model also has some disadvantages:

1. It requires an extensive data set and the steps preliminary to use of the model require updating and verification of data and many hand calculations.

2. Its reliance on informed judgement of experts can make its use cumbersome and time consuming.

3. It is essentially a rigid mechanical process. Significant deviations from current practice/service arrangements might require base data, categories, assumptions, and report formats to be revised and/or extended.

SUMMARY AND CONCLUSIONS

In any problem area as complex as nursing manpower, no model or procedure constitutes an "answer machine." Projections by themselves do not constitute a decision or tell a policy maker what to do. A model's usefulness lies rather in indicating changes that can be expected based on different assumptions about the future. This usefulness is dependent on the extent to which appropriate relationships and accurate data have been entered properly into the system by the user.

This report has described briefly a State-level model developed to project nursing requirements five years hence. The model is a set of procedures for projecting, based on current data and user assumptions, the requirements for nursing personnel by level of preparation, job responsibility and service setting five years in the future. Incorporating procedures for projecting nursing resources, the model provides one means of identifying future needs in respect to the nursing component of health manpower. It is seen as a particularly useful model because of the ability to determine the effect of altering one or more components of the system. Given the increased demands for numerical projections, the model seems to be a viable tool to support health planning and policy making decisions.

One of the strengths of this model is that it creates opportunities for communication among those knowledgeable and responsible for different aspects of health planning. Although this may slow the analysis process, it will undoubtedly lead both to better understanding of problems and future prospects and to policies and procedures that are more easily justified and implemented.

Although the model was developed and tested for nursing manpower, the model has strong potential as a tool for studying other health professions as well. It also could be used to advantage at the sub-state (HSA) level. This would permit recognition of differences in population density, health services, and the distribution of nursing personnel not possible in a State-level analysis.

APPENDIX A

To illustrate the kinds of input data required to support the model, a sample set of assumption sheets has been assembled in this appendix. These also suggest the kinds of "what if" questions that can be addressed using the model.

ASSUMPTIONS WORKSHEET

ASSUMPTION 1

	1976	1981
1. TOTAL NUMBER OF INDIVIDUALS	ESTIMATED POPULATION	ESTIMATED POPULATION
	18,245,520	18,405,723

ASSUMPTION 2

	1976 ESTIMATED SERVICE TO POPULATION RATIO	1981 ESTIMATED SERVICE TO POPULATION RATIO
INPATIENT SERVICES		
1. BASSINETS	3.71 /10,000 pop.	3.53 /10,000 pop.
2. GENERAL MED-SURG BEDS	73.23	68.62
3. ICU BEDS	1.64	1.72
4. CCU BEDS	.51	.53
5. SELF-CARE UNIT BEDS	.69	.62
6. EXTENDED CARE UNIT BEDS	56.23	56.23
7. REHABILITATION UNIT BEDS	1.11	1.13
8. PSYCHIATRIC UNIT BEDS	2.33	2.45
9. NURSING HOME BEDS	18.74	19.68
10. SURGICAL OPERATIONS	730.93	804.02
AMBULATORY SERVICES		
11. REFERRED VISITS	3235.93 /10,000 pop.	3559.52 /10,000 pop.
12. FAMILY PLANNING VISITS	249.60	287.04
13. OUTPATIENT CLINIC VISITS	7025.84	7728.42
14. PHYSICIAN'S OFFICE VISITS		
15. INDEPENDENT PRACTICE VISITS	1573.62	1730.98
16. COMMUNITY HEALTH CENTER VISITS	3128.23	3128.23
17. OCCUPATIONAL HEALTH VISITS		
18. SCHOOL NURSE VISITS	1847.29	1833.24
EMERGENCY SERVICES		
19. EMERGENCY VISITS	3849.05 /10,000 pop.	4233.96 /10,000 pop.
OUTREACH SERVICES		
20. HOME CARE VISITS	887.55 /10,000 pop.	976.31 /10,000 pop.

ASSUMPTIONS WORKSHEET (CONT.)

SUMPTION 3

	1976 ESTIMATED DCC RN TO SERVICE RATIO	1981 ESTIMATED DCC RN TO SERVICE RATIO
INPATIENT SERVICES		
1. BASSINETS	2.4 /10 Beds	3.0 /10 Beds
2. GENERAL MED-SURG BEDS	3.7	3.7
3. ICU BEDS	10.5	12.5
4. CCU BEDS	10.5	12.5
5. SELF-CARE UNIT BEDS	1.0	1.0
6. EXTENDED CARE UNIT BEDS	0.54	1.0
7. REHABILITATION UNIT BEDS	3.7	6.0
8. PSYCHIATRIC UNIT BEDS	3.7	3.7
9. NURSING HOME BEDS	0.54	0.54
10. SURGICAL OPERATIONS	2.0 /1,000 Operations	2.0 /1,000 Operations
AMBULATORY		
11. REFERRED VISITS	1.0 /10,000 Visits	1.5 /10,000 Visits
12. FAMILY PLANNING VISITS	12.06	12.06
13. OUTPATIENT CLINIC VISITS	1.0	1.5
14. PHYSICIAN'S OFFICE VISITS		
15. INDEPENDENT PRACTICE VISITS	1.74	1.74
16. COMMUNITY HEALTH CENTER VISITS	1.0	1.5
17. OCCUPATIONAL HEALTH VISITS		
18. SCHOOL NURSE VISITS	6.0	6.0
EMERGENCY SERVICES		
19. EMERGENCY VISITS	1.0 /10,000 Visits	1.5 /10,000 Visits
OUTREACH SERVICES		
20. HOME CARE VISITS	11.51 /10,000 Visits	11.52 /10,000 Visits

ASSUMPTION 4

ASSUMPTIONS WORKSHEET (CONT.)

	1976 ESTIMATED DCC RN EDUCATIONAL VECTOR						1981 ESTIMATED DCC RN EDUCATIONAL VECTOR					
INPATIENT SERVICES	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
1. BASSINETS	0.1	1.0	11.6	11.9	75.5	= 100%	0.1	2.0	25.0	10.0	63.0	= 100%
2. GENERAL MED-SURG BEDS	0.1	1.0	11.6	11.9	75.5		0.1	2.0	25.0	10.0	63.0	
3. ICU BEDS	0.1	1.0	11.6	11.9	75.5		0.1	2.0	25.0	10.0	63.0	
4. CCU BEDS	0.1	1.0	11.6	11.9	75.5		0.1	2.0	25.0	10.0	63.0	
5. SELF-CARE UNIT BEDS	0.1	1.0	11.6	11.9	75.5		0.1	2.0	25.0	10.0	63.0	
6. EXTENDED CARE UNIT BEDS	0.1	0.9	8.3	5.9	84.8		0.1	0.9	8.3	5.9	84.8	
7. REHABILITATION UNIT BEDS	0.1	1.0	11.6	11.9	75.5		0.1	1.0	11.6	11.9	75.5	
8. PSYCHIATRIC UNIT BEDS	0.1	1.0	11.6	11.9	75.5		0.1	1.0	11.6	11.9	75.5	
9. NURSING HOME BEDS	0.1	0.9	8.3	5.9	84.8		0.1	5.0	5.0	17.0	70.0	
10. SURGICAL OPERATIONS	0.1	1.0	11.6	11.9	75.5		0.1	1.0	11.6	11.9	75.5	
AMBULATORY SERVICES												
11. REFERRED VISITS	0.1	3.2	38.6	5.3	52.9	= 100%	0.0	3.0	50.0	10.0	37.0	= 100%
12. FAMILY PLANNING VISITS	0.0	3.0	50.0	10.0	37.0		0.0	3.0	50.0	10.0	37.0	
13. OUTPATIENT CLINIC VISITS	0.1	3.2	38.6	5.3	52.9		0.1	3.2	38.6	5.3	52.9	
14. PHYSICIAN'S OFFICE VISITS												
15. INDEPENDENT PRACTICE VISITS	3.0	32.7	24.8	0.0	39.6		3.0	32.7	24.8	0.0	39.6	
16. COMMUNITY HEALTH CENTER VISITS	0.1	3.2	38.6	5.3	52.9		3.0	3.0	50.0	10.0	37.0	
17. OCCUPATIONAL HEALTH VISITS												
18. SCHOOL NURSE VISITS	0.4	10.2	57.3	3.0	32.1		0.0	25.0	75.0	0.0	0.0	
EMERGENCY SERVICES												
19. EMERGENCY VISITS	0.1	1.0	11.6	11.9	75.5	= 100%	0.1	1.0	11.6	11.9	75.5	= 100%
OUTREACH SERVICES												
20. HOME CARE VISITS	0.1	1.0	38.6	7.5	52.9	= 100%	0.0	3.0	50.0	10.0	37.0	= 100%

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 5

	1976 ESTIMATED ADMIN TO DCC RN RATIO	1981 ESTIMATED ADMIN TO DCC RN RATIO
1. HOSPITAL	1.5 /10 DCC RNs	1.5 /10 DCC RNs
2. NURSING HOME	27.72	1.5
3. COMMUNITY HEALTH	2.63	2.6
4. PHYSICIAN'S OFFICE		
5. SCHOOLS	0.28	0.6
6. INDUSTRY		
7. INDEPENDENT/GROUP PRACTICE	0.0	0.0

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ASSUMPTION 6

	1976 ESTIMATED ADMIN RN EDUCATIONAL VECTOR						1981 ESTIMATED ADMIN RN EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
1. HOSPITAL	0.1	4.5	12.9	7.2	75.4	= 100%	0.5	11.9	37.8	0.0	49.8	= 100%
2. NURSING HOME	0.2	2.7	3.0	6.6	82.4		0.2	3.0	12.0	6.6	78.0	
3. COMMUNITY HEALTH	0.7	14.3	35.0	4.2	37.9		1.0	20.0	61.0	3.0	15.0	
4. PHYSICIAN'S OFFICE												
5. SCHOOLS	0.0	13.3	17.3	1.3	68.0		0.0	100.0	0.0	0.0	0.0	
6. INDUSTRY												
7. INDEPENDENT/GROUP PRACTICE	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 7

		1976 ESTIMATED LPN TO DCC RN RATIO	1981 ESTIMATED LPN TO DCC RN RATIO
1.	HOSPITAL	0.5 /1 DCC RN	0.25 /1 DCC RN
2.	NURSING HOME	3.4	5.0
3.	COMMUNITY HEALTH	0.07	0.05
4.	PHYSICIAN'S OFFICE		
5.	SCHOOLS	0.0	0.0
6.	INDUSTRY		
7.	INDEPENDENT/GROUP PRACTICE	0.25	0.25

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ASSUMPTION 8

		1976 ESTIMATED AIDE TO DCC RN RATIO	1981 ESTIMATED AIDE TO DCC RN RATIO
1.	HOSPITAL	0.5 /1 DCC RN	0.5 /1 DCC RN
2.	NURSING HOME	0.0	6.0
3.	COMMUNITY HEALTH	0.19	0.72
4.	PHYSICIAN'S OFFICE		
5.	SCHOOLS	0.0	1.5
6.	INDUSTRY		
7.	INDEPENDENT/GROUP PRACTICE	0.0	0.5

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 9

		1976 ESTIMATED NURSING STUDENTS	1981 ESTIMATED NURSING STUDENTS
1.	PhD PROGRAM	405	550
2.	MASTER'S PROGRAM	1,706	2,200
3.	BACCALAUREATE PROGRAM	15,089	15,000
4.	ASSOCIATE PROGRAM	11,735	5,800
5.	DIPLOMA PROGRAM	6,718	3,500
6.	PRACTICAL NURSING PROGRAM	7,286	6,500

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ASSUMPTION 10

		1976 ESTIMATED FACULTY TO STUDENT RATIO	1981 ESTIMATED FACULTY TO STUDENT RATIO
1.	PhD PROGRAM	0.7 /10 STUDENTS	4.0 /10 STUDENTS
2.	MASTER'S PROGRAM	0.6	2.0
3.	BACCALAUREATE	0.5	1.0
4.	ASSOCIATE PROGRAM	0.6	1.0
5.	DIPLOMA PROGRAM	1.26	1.0
6.	PRACTICAL NURSING PROGRAM	0.94	1.0

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 11

	1976 ESTIMATED FACULTY EDUCATIONAL VECTOR						1981 ESTIMATED FACULTY EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
1. PhD PROGRAM	13.2	78.9	7.8	0.0	0.0	= 100%	90.0	10.0	0.0	0.0	0.0	= 100%
2. MASTER'S PROGRAM	13.2	78.9	7.8	0.0	0.0		25.0	75.0	0.0	0.0	0.0	
3. BACCALAUREATE PROGRAM	13.2	78.9	7.8	0.0	0.0		25.0	75.0	0.0	0.0	0.0	
4. ASSOCIATE PROGRAM	2.2	70.1	24.4	2.2	1.0		3.0	80.0	17.0	0.0	0.0	
5. DIPLOMA PROGRAM	0.4	40.0	48.3	2.1	9.2		0.4	55.0	39.0	0.0	5.0	
6. PRACTICAL NURSING PROGRAM	0.0	23.0	43.0	6.2	27.0		0.4	25.0	50.0	0.0	25.0	

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ASSUMPTION 12

	1976 ESTIMATED ADMIN TO FACULTY RATIO	1981 ESTIMATED ADMIN TO FACULTY RATIO
1. PhD PROGRAM	0.5 /10 Faculty	2.0 /10 Faculty
2. MASTER'S PROGRAM	0.5	2.0
3. BACCALAUREATE PROGRAM	0.5	0.5
4. ASSOCIATE PROGRAM	0.6	0.5
5. DIPLOMA PROGRAM	0.7	0.5
6. PRACTICAL NURSING PROGRAM	0.5	0.5

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 13

	1976 ESTIMATED ADMIN EDUCATIONAL VECTOR						1981 ESTIMATED ADMIN EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
1. PhD PROGRAM	100.0	0.0	0.0	0.0	0.0	= 100%	100.0	0.0	0.0	0.0	0.0	= 100%
2. MASTER'S PROGRAM	90.0	10.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0	
3. BACCALAUREATE PROGRAM	75.0	25.0	0.0	0.0	0.0		80.0	20.0	0.0	0.0	0.0	
4. ASSOCIATE PROGRAM	14.0	78.0	0.0	4.0	4.0		15.0	85.0	0.0	0.0	0.0	
5. DIPLOMA PROGRAM	2.0	92.0	0.0	0.0	6.0		2.0	95.0	0.0	0.0	3.0	
6. PRACTICAL NURSING PROGRAM	1.0	52.0	45.0	1.0	1.0		1.0	49.0	50.0	0.0	0.0	

ASSUMPTION 14

	1976	1981
1. NUMBER OF LARGE HOSPITALS	137 LARGE HOSPITALS	137 LARGE HOSPITALS
2. RESEARCHERS, INSTRUCTORS, AND CONSULTANTS	25.0 /1 LARGE HOSPITAL	35.0 /1 LARGE HOSPITAL

	1976 ESTIMATED RESEARCHER, INSTRUCTOR AND CONSULTANT EDUCATIONAL VECTOR						1981 ESTIMATED RESEARCHER, INSTRUCTOR AND CONSULTANT EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
3. EDUCATIONAL PREPARATION	0.4	20.0	36.0	5.0	38.0	= 100%	1.0	25.3	40.4	2.0	31.3	= 100%

ASSUMPTIONS WORKSHEET (CONT.)

ASSUMPTION 15

	1976	1981
1. ESTIMATED NUMBER OF RNs WORKING IN HEALTH-RELATED ORGANIZATIONS	100 /1,000,000 Population	100 /1,000,000 Population

	EDUCATIONAL VECTOR						EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
2. EDUCATIONAL PREPARATION	2.4	26.9	15.6	3.8	51.4	= 100%	4.0	30.0	15.0	4.0	47.0	= 100%

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ASSUMPTION 16

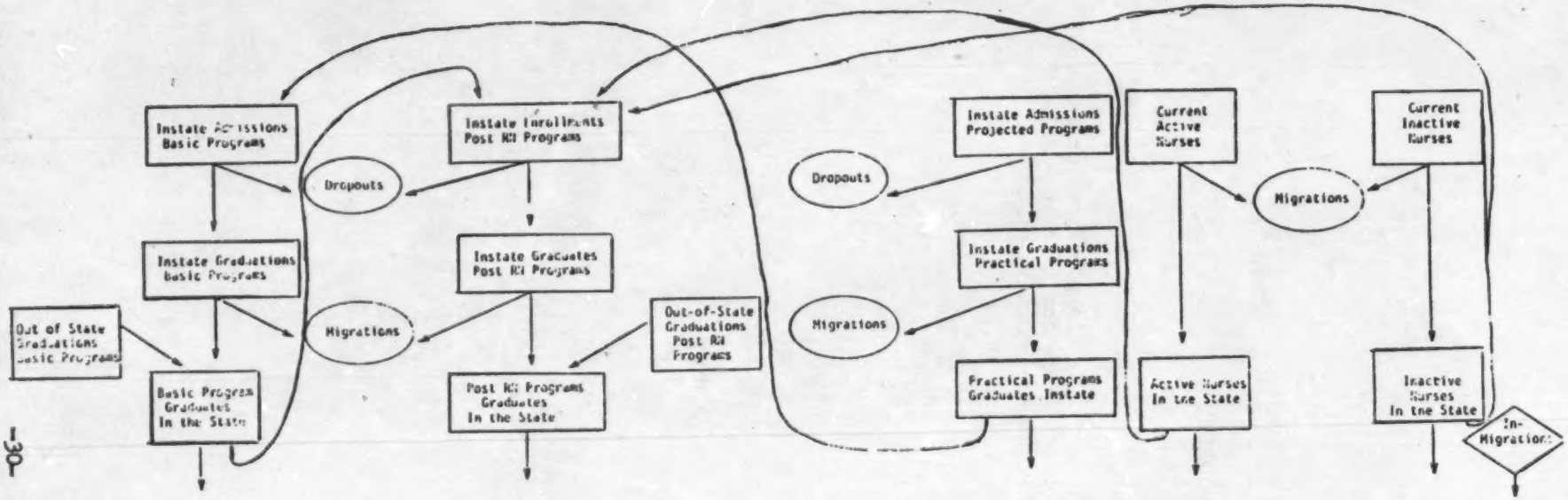
	1976	1981
1. ESTIMATED NUMBER OF PRIVATE DUTY NURSES	28 /100,000 Population	22 /100,000 Population

	EDUCATIONAL VECTOR						EDUCATIONAL VECTOR					
	DOC	MASTER'S	BACC	ASSOC	DIP		DOC	MASTER'S	BACC	ASSOC	DIP	
2. EDUCATIONAL PREPARATION	0.3	2.3	7.5	4.6	85.3	= 100%	.3	2.3	7.5	4.6	85.3	= 100%

APPENDIX B

The process of developing nursing manpower resources in a state is a complex one. The basic relationships included in the WICHE model are shown in Figure 4.

Figure 4. A Detailed Resources Projection Model



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